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Socioeconomic, demographic, and clinical profile of COVID patients in north coastal districts of Andhra Pradesh

Siva Prasad Reddy Basava[1], Aruna Rani Behera[2], Sangeeta Panigrahy[3], Pradeep Vegi[4], Samatha P[5], Balachandrasekhar P[6], Sai Saileshkumar Goothy[7]

[1]Associate Professor, [2,3,6]Assistant Professor, [5]Professor, Department of Microbiology, [4]Assistant Professor, Department of Biochemistry, Great Eastern Medical School and Hospital, Ragolupeta, Andhra Pradesh, [7]Associate Professor, Department of Physiology, R D Gardi Medical College, Ujjain, Madhya Pradesh, India

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ABSTRACT

Background: The unprecedented outbreak of a contagious respiratory disease caused by a novel coronavirus has led to a pandemic since December 2019, claiming millions of lives. **Aims and Objectives:** The present study was undertaken to estimate the various risk factors associated with COVID, to study the common presenting symptoms and prognosis, and to estimate the degree of association between computed tomography (CT) value in reverse transcription polymerase chain reaction (RT-PCR) with mode of disease transmission in north coastal districts of Andhra Pradesh. **Materials and Methods:** This was a cross-sectional study comprising of 1462 COVID-positive individuals. It is based on structured questionnaire on demographic, socioeconomic and symptoms, and correlation of clinical pattern with CT value in RT-PCR and further prognosis. **Results:** Diabetes (6.7%), hypertension (7.5%), and bronchial asthma (8.6%) are the main comorbid conditions. Middle (44.6%) and low socioeconomic status (47.3%) are more susceptible. Male gender (63.5%) is more affected, especially 16–30 years age group (32.4%). Vaccination offers considerable protection from infection. Contact (59.4%) with known case and travel (31%) are main factors that determine disease transmission. Blood group may not play a role in COVID susceptibility. Health care workers (22.9%) and students (16.2%) are mostly affected. **Conclusion:** Bronchial asthma, hypertension, and diabetes mellitus are the predominant risk factors associated with COVID. Transmission of the disease is more by virtue of contact with the infected person than by travel.

Key words: Ageusia; Anosmia; Computed tomography value; COVID; Demographic; Fatigue; Fever; Nasopharyngeal swab; Oropharyngeal swab; Pandemic; Positive; Reverse transcription polymerase chain reaction; SARS-CoV-2; Wuhan

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INTRODUCTION

In December 2019, a cluster of acute respiratory illness of unknown cause occurred in the city of Wuhan in Hubei Province, China. This mystery illness is now known as SARS-CoV-2 pneumonia or coronavirus disease 19 (Covid-19). What started out as a small cluster in China has now spread throughout the world through international travel and was declared a pandemic by the WHO on March 11, 2020.[1] To date (October 21, 2021), over 242 million cases and 4.9 million deaths were reported globally out of which India alone reported 34 million cases and 0.45 million deaths. The clinical presentation is diverse ranging from mild and asymptomatic cases at one end to fatal outcome at other end.

The pandemic is characterized by substantial geographic variation in incident cases and hospitalizations due to the illness and attributable mortality.[2] The silent progress of pandemic in India created various new risk factors for

Address for Correspondence:
Dr. Siva Prasad Reddy Basava, Associate Professor, Department of Microbiology, Great Eastern Medical School and Hospital, Ragolupeta - 532 484, Andhra Pradesh, India. **Mobile:** +91-8897243394. **E-mail:** sivabasava83@gmail.com

disease incidence and outcome. Occupational exposure to health care workers and other professions by virtue of job is one of the significant risk factors. Low income may affect living conditions especially overcrowded housing. Lower education level is indirectly associated with a number of factors that may increase risk of COVID-19 such as increased smoking and poor nutrition which could suppress the immune system.[3] Cigarette smoking induces expression of angiotensin converting enzyme 2 which allows SARS-CoV-2 to enter cells and could possibly influence viral invasion beyond its negative effects on overall lung function.[4]

Aims and objectives

The present study was undertaken

1. To estimate the various risk factors associated with COVID
2. To study the common presenting symptoms and prognosis
3. To estimate the degree of association between computed tomography (CT) value in reverse transcription polymerase chain reaction (RT-PCR) with mode of disease transmission in north coastal districts of Andhra Pradesh.

MATERIALS AND METHODS

The present study was undertaken in the Viral Research and Diagnostic Laboratory section of the Department of Microbiology, Great Eastern Medical School and Hospital, Ragolu, Srikakulam, over a period of 4 months from June 2021 to September 2021. The Institutional Ethical Committee approval was taken.

This cross-sectional study is based on structured questionnaire and correlation of clinical pattern with CT value in RT-PCR and further prognosis. Information on blood group, comorbid conditions, socioeconomic status, education, occupation, smoking, alcohol intake, clinical manifestations, vaccination status including type of vaccine taken and dose, recent travel, any contact in family or neighborhood, and CT value in RT-PCR are collected.

Inclusion criteria

All people who got tested for RT-PCR (SARS-CoV-2) and declared as positive as per standard guidelines issued by ICMR were included in the study.

Criteria specified by ICMR toward RT-PCR for SARS-CoV-2

Ct value cutoff of 35 with a good sigmoidal real-time RT-PCR curve is acceptable.

All patients with a Ct value <35 or =35 are considered as positive while those with Ct value >35 are considered as negative. All samples with Ct value ≤35 with poor sigmoidal curves are retested.

Exclusion criteria

All people who got tested for RT-PCR (SARS-CoV-2) and declared as negative as per standard guidelines issued by ICMR were excluded from the study.

Statistical analysis

Data were collected in Microsoft Excel sheet. Results were expressed in percentage and measure of probability was analyzed to determine statistical significance.

RESULTS

The present study was undertaken at GEMS and Hospital which included all COVID-positive patients as per ICMR guidelines by RT-PCR. Total patients enrolled in study were 1462.

Risk factors associated with COVID

Comorbid conditions

We have observed diabetes mellitus, hypertension, stroke, asthma, allergy, chronic obstructive pulmonary disease, thyroid abnormalities, and gallbladder stones as common comorbid conditions in COVID-positive patients. Asthma and allergy were observed as the single most associated comorbid condition in 126 (8.6%) patients followed by hypertension 110 (7.5%). Diabetes mellitus was observed in 98 (6.7%) of patients. We observed both diabetes and hypertension in 67 (4.5%) of COVID-positive patients. Other conditions such as stroke, thyroid abnormalities, and gallstones were seen in 53 (3.6%) of patients. Majority of COVID-positive patients1008 (68.9%) did not have any predisposing comorbid condition (Table 1).

Socioeconomic status

In our study, COVID positivity was observed more among low- and middle-class people as compare to high class. Out

Table 1: Distribution according to comorbid condition

Comorbid conditions	No.of positives (%)
Allergy, asthma	126 (8.6)
DM	98 (6.7)
HTN	110 (7.5)
DM, HTN	67 (4.5)
Others (GBstone, thyroid, and stroke)	53 (3.6)
No	1008 (68.9)
Total	1462 (100)

HTN: Hypertension, DM: Diabetes mellitus, GB: Gallbladder

of 1462 COVID-positive people, 692 (47.3%) belong to low socioeconomic class, 652 (44.6%) belong to middle socioeconomic class, and 118 (8.1%) belong to upper socioeconomic class (Table 2).

Smoking and alcoholism

We observed smoking habit in 99 (6.8%) and alcohol intake in 40 (2.7%) of COVID-positive patients. The majority of patients 1323 (90.5%) did not have any history of smoking or alcohol intake (Table 3).

Sex and age

COVID positivity was seen more in male population as compared to females. Out of 1462 positive patients, 928 (63.5%) are male and 534 (36.5%) are female (Table 4).

In our study, COVID positivity was seen more in teenagers and young adults followed by adults and the elderly. Out of 1462 susceptible people, 474 (32.4%) are in 16–30 years age group, 415 (28.4%) in 31–45 years age group, 335 (22.9%) in 46–60 years age group, 178 (12.2%) are above 60 years, and 60 (4.1%) are below 15 years of age (Figure 1).

Vaccination status

We observed more COVID susceptibility among the non-vaccinated than the vaccinated. A total of 968 (66.21%) of non-vaccinated individuals are COVID susceptible whereas 494 (33.7%) of vaccinated are susceptible. Two hundred and eighteen (14.86%) are vaccinated with CoviShield whereas 276 (18.87%) are vaccinated with Covaxin (Table 5).

Table 2: Distributions of patients according to socioeconomic status

Socioeconomic status	No.of positives (%)
High	118 (8.1)
Middle	652 (44.6)
Low	692 (47.3)
Total	1462 (100)

Table 3: Distribution according to addictions

Addictions	No.of positives (%)
Smoking habit	99 (6.8)
Alcohol intake	40 (2.7)
No	1323 (90.5)
Total	1462 (100)

Table 4: Gender-wise distributions of patients

Gender	No.of positives (%)
Male	928 (63.5)
Female	534 (36.5)
Total	1462 (100)

Travel and contact history

We have observed that recent travel and contact with a known COVID person are the predisposing factors to disease. Out of 1462 infected, 454 (31%) had recent travel history whereas 869 (59.4%) had contact history and 139 (9.5%) did not have either history (Table 6).

Blood group

Among those infected, 928 (63.5%) were O +ve blood group, 335 (22.9%) were B +ve, 120 (8.2%) were A +ve, and 79 (5.4%) were AB + ve (Table 7).

Profession

Our study revealed more susceptibility among health care workers 335 (22.9%) followed by students 237 (16.2%) and self-employed 158 (10.8%) (Figure 2).

Table 5: Distributions of patients according to vaccination status

Vaccination status	No.of positives (%)
Covaxin I	158 (10.81)
Covaxin II	118 (8.10)
CoviShield I	218 (14.86)
CoviShield II	0 (0)
No vaccine	968 (66.21)
Total	1462 (100)

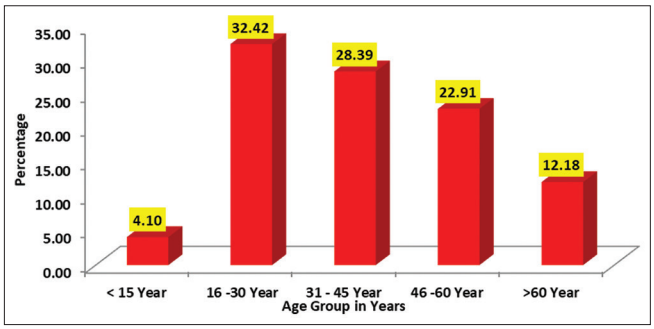

Figure 1: Distribution of patients according to age

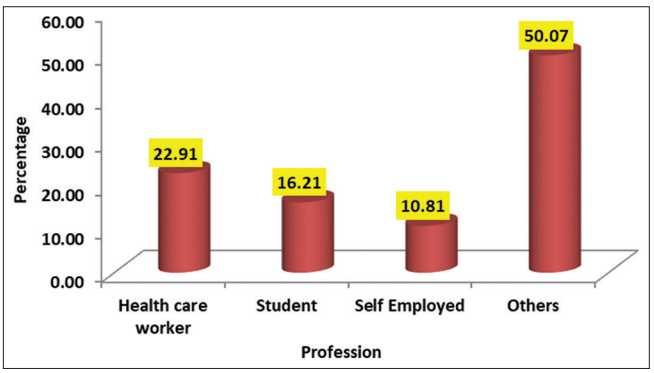

Figure 2: COVID positivity in relation to profession

Common presenting symptoms and prognosis

Common presenting symptoms

We observed that fever is the most common presenting symptom in association. However, anosmia and ageusia were seen in 414 (28.3%) of the patients which were typically observed after a week of initial prodromal symptoms. Fever alone was observed in 178 (12.2%), fever and sore throat were observed in 177 (12.1%), fever with fatigue, body pains, and headache were seen in 237 (16.2%), and fever with cold, cough, and dyspnea were seen in 296 (20.2%). Gastrointestinal symptoms such as pain abdomen, diarrhea, and loss of appetite were seen in 87 (5.9%) of COVID-positive patients. Seventy-three (4.9%) of patients were asymptomatic (Table 8).

Prognosis

In our study, the prognosis was good in 1422 (97.3%) of the infected and the remaining 40 (2.7%) have succumbed to the disease (Table 9). Stroke was the main risk factor among those who succumbed to the disease.

Degree of association between CT values in RT-PCR with mode of disease transmission

In our study, major patients had medium viral load (CT 18–24). High viral load (CT <17) in COVID-positive patients was observed in 512 (35%) of patients out of which 80 (5.4%) patients revealed recent travel history, 139 (9.5%) had contact history with a known positive patient, and 293 (20%) did not have either history. Medium viral load (CT 18–24) was observed in 632 (43.2%) of patients out of which 198 (13.5%) patients underwent recent travel, 296 (20.2%) had contact history with a known positive patient, and 138 (9.4%) did not have either history. Low viral load (CT 25–35) was observed in 318 (21.7%) of patients out of which 80 (5.4%) underwent recent travel, 178 (12.1%) had contact history with a known positive patient, and 60 (4.1%) did not have either history (Table 10).

Table 6: Distributions of patients according to contact and travel history

Recent travel history/contact	No.of positives (%)
Travel	454 (31.0)
Contact	869 (59.4)
No	139 (9.5)
Total	1462

Table 7: COVID positivity in relation to blood group

Blood group	No.of positives (%)
A+ve	120 (8.2)
AB+ve	79 (5.4)
B+ve	335 (22.9)
O+ve	928 (63.5)
Total	1462

Table 8: COVID positivity in relation to presenting symptoms

Symptom	No.of positives (%)
Fever, cold, cough, and dyspnea	296 (20.2)
Anosmia and Ageusia	414 (28.3)
Fever, fatigue, bodypains, and headache	237 (16.2)
Only fever	178 (12.2)
Pain abdomen, diarrhea, and loss of appetite	87 (5.9)
Asymptomatic	73 (4.9)
Fever and sore throat	177 (12.1)
Total	1462

Table 9: Distribution of patients based on prognosis

Prognosis	No.ofpositives (%)
Good	1422 (97.3)
Bad	40 (2.7)
Total	1462

Table 10: Correlation of CT value in RT-PCR with mode of disease transmission

CT value	Travel history(%)	Contact history(%)	None (%)
>17	80 (5.4)	139 (9.5)	293 (20)
18–24	198 (13.5)	296 (20.2)	138 (9.4)
25–35	80 (5.4)	178 (12.1)	60 (4.1)

Statistical analysis was performed showing χ^2=205.528; df=4; P=0.000<0.001 and is highly statistically significant

DISCUSSION

Risk factors

Comorbid conditions

In the present study, COVID was observed with comorbid conditions in 31% of patients which was lower as compared to Margherita et al.,[5] which reported 55%. This difference may be attributed to the sample size and geographical variation. They reported hypertension (42%), cardiovascular diseases (20%), diabetes mellitus (10%), and malignancy (10%) whereas a study by Wang et al.,[6] reported cardiovascular diseases, diabetes, chronic respiratory disease, hypertension, and cancers as comorbid conditions. These comorbid conditions were high risk factors for patients with COVID-19.

Socioeconomic status

We found more COVID susceptibility among the low and middle socioeconomic status population than the high status one. This may be due to more population density,

chronic malnutrition, poor health infrastructure, large family size, poor hygiene practices, overcrowding, poverty concentration, and marginalization including lower health-related knowledge and awareness.

Smoking and alcoholism

Smoking is one of the risk factors for the development and worsening of multiple respiratory diseases including infections. In our study, 6.8% of COVID-positive patients had smoking history which correlated with a study by Patanavanich et al.,[7] where 6.3% had smoking history. Heavy alcohol intake profoundly changes pulmonary innate and adaptive immunity, leading to higher rates of viral pneumonia, influenza A infection, respiratory syncytial virus infection, and bacterial pneumonia.[8] While less than 15% of consumed alcohol enters the lung, exhalation is a significant process for alcohol excretion. In our study, 2.7% of COVID-positive patients had a habit of alcohol intake.

Sex and age

Male gender (63.5%) is more susceptible to COVID than females (36.5%) in our study which may be attributed to more outdoor activity and travel by virtue of profession, habits of smoking, and alcohol intake. My findings support the scientific theory that androgen receptors play a key role in the transcription of transmembrane protease serine 2 which is necessary for the priming of the viral S protein of SARS-CoV-2 and further spread in the human body.[9] However, a study by Foresta et al.,[10] has demonstrated lower infection rate in males (45.8%) than females (54.2%) whereas a study by Jin et al.,[11] showed equal susceptibility to COVID by both genders. Lui et al.,[12] study is in line with our study which reported 40.43% infection rate in males and 36.71% infection rate in females. We found 16–30 years age group as most vulnerable (32.4%) to COVID-19 which correlated with the findings of Davies et al.[13] This may be due to the reason that the study was conducted in a tertiary care hospital with attached medical college which drives more student population to get tested for COVID-19. Further, this age group is more active in the society and is involved in activities such as travel, parties, smoking, alcoholism, and living in close intimacy with each other and moving in groups which is a major risk factor for exposure to COVID infection.

Vaccination status

Vaccine breakthrough infection is defined as the detection of SARS-CoV-2 RNA or antigen in a respiratory specimen collected from a person more than or equal to 14 days after receipt of all recommended doses of an approved COVID-19 vaccine.[14] Dash et al.,[15] reported confirmed breakthrough infection in 12.8% of individuals who received Covaxin and 87.2% of individuals who received CoviShield. Breakthrough infection may be due to the fact that the person is infected already at the time of vaccination, infection acquired before antibody formation, the variant may bypass vaccine induced immunity due to mutation (variants of concern), short life of immunity or protection after vaccination, patient already on immunosuppression or use of steroids, and supply chain challenges in vaccine distribution.[16]

Travel and contact history

Recent travel and contact with a known case are major risk factors for COVID susceptibility. We observed that most of the patients underwent home isolation and treatment due to financial constraints, fear of hospital admission, and non-availability of beds in hospitals. The attenders at home who were serving them stated contact history as prime reason for contracting COVID.

Blood group

The ABO blood group has been previously found to contribute to the risk of multiple infectious diseases in various studies. Ali and Pourfathollah[17] reported that the presence of blood group O might significantly decrease the risk of hepatitis B and the distribution of Rh in HBV-infected individuals was higher between Rh-positive donors. Elnady et al., found that rota positive status for rotavirus gastroenteritis was significantly more prevalent among those with blood type A and less in those with blood type B.[18] Our study revealed more COVID susceptibility among the O blood group followed by B. This may be attributed to the normal prevalence of blood group in the Indian population. However, a study by Padhi et al.,[19] showed that blood group B is more predisposing and blood group O is more to COVID.

Profession

Health care workers and students are more prone to COVID which may be due to more chances of exposure due to the respective behaviors. In our study, 22.9% of health care workers were most commonly affected which are in line with Lan et al.,[20] which show COVID transmission in 22% of health care workers.

Presenting symptoms and prognosis

Our clinical symptoms are in correlation with Larsen et al.,[21] who report fever as the primary symptom. We reported anosmia and ageusia in 28.3% which was more compared to a study by Al-Ani and Acharya[22] which showed both anosmia and ageusia in 8.51%, anosmia in 4.96%, and ageusia in 11.35% of COVID patients.

Degree of association between CT values in RT PCR with mode of disease transmission

In comparison of mode of disease transmission, there is a significant correlation (P=0.000) between contact history and CT value. This may be due to ease of stringent safety precautions at home, especially while attending the infected person.

Limitations of the study

The study sample may not be representing the general population by virtue of the location of hospital and the predominant student and health-care population in close proximity

CONCLUSION

Comorbid conditions such as diabetes, hypertension, stroke, bronchial asthma, gallstones, thyroid, and specific habits such as smoking and alcohol intake act as risk factors for COVID-19. Males are more susceptible to COVID, especially the young adults and middle age group. Low and middle socioeconomic status is more prone to COVID. There is no significant predisposition to COVID by virtue of blood group. Fever is initial symptom associated with either upper or lower respiratory symptoms based on the extent of infection. However, anosmia and ageusia are observed in the majority of COVID-positive patients irrespective of extent of infection after 1–2 weeks after fever and other primary symptoms. Transmission of the disease is more by virtue of contact with the infected person than by travel.

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Authors' Contributions:
SPRB- Concept and design of study, prepared first draft of manuscript; **ARB**- Interpreted the results; **SP**- Reviewed the literature; **PV**- Statistical analysis and interpretation; **SP**- Concept; **PBC**- Coordination and manuscript preparation; and **SSKG**- Revision of manuscript.

Work attributed to:
Great Eastern Medical School and Hospital, Ragolupeta - 532 484, Andhra Pradesh, India.

ORCID ID:
Dr. Siva Prasad Reddy Basava- https://orcid.org/0000-0001-8369-2150
Dr. Aruna Rani Behera- https://orcid.org/0000-0002-2451-8766
Dr. Sangeeta Panigrahy- https://orcid.org/0000-0001-6880-3270
Pradeep Vegi- https://orcid.org/0000-0001-5382-8520
Samatha P- https://orcid.org/0000-0002-5036-8052
Balachandrasekhar P- https://orcid.org/0000-0002-1066-4754
Sai Saileshkumar Goothy- https://orcid.org/0000-0002-5838-3994

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